

5-9 Complex Numbers

$$\sqrt{-1} = i$$

$$i^2 = -1$$

Simplify.

$$\sqrt{-5} \quad i\sqrt{5}$$

$$\sqrt{-25} \quad 5i$$

$$\sqrt{-50} \quad 5i\sqrt{2}$$

$$\sqrt{-28} \quad 2i\sqrt{7}$$

$$\sqrt{28} \quad 2\sqrt{7}$$

$$i^{17} \\ i(i^{16}) \\ i(i^2)^8 \\ i$$

$$i^{46} \\ (i^2)^{23} \\ (-1)^{23} \\ -1$$

$$i^2 = -1$$

$$i^{19} \\ i(i^{18}) \\ i(i^2)^9 \\ i(-1)^9 \\ -i$$

Multiplication

ex:

$-3i \cdot 2i$

$$\begin{aligned} & -6i^2 \\ & -6(-1) \\ & \quad \textcircled{6} \end{aligned}$$

Must simplify 1st!

ex:

$$\begin{aligned} & \sqrt{-12} \cdot \sqrt{-2} \\ & 2i\sqrt{3} \cdot i\sqrt{2} \\ & 2i^2\sqrt{6} \\ & -2\sqrt{6} \end{aligned}$$

ex:

$$\begin{aligned} & \sqrt{4} \cdot \sqrt{-25} \\ & 2i \cdot 5i \\ & -10 \end{aligned}$$

Add and Subtract

ex:

$$\begin{aligned} & \sqrt{16} - \sqrt{-49} \\ & 4i - 7i \\ & -3i \end{aligned}$$

ex:

$$i\sqrt{4} + 3i\sqrt{4}$$

$$4i\sqrt{2}$$

Solve.

$$5y^2 + 20 = 0$$

$$5y^2 = -20$$

$$\sqrt{4}y^2 = \sqrt{-4}$$

$$y = \pm 2i$$

Cannot leave i in the denominator

$$\frac{2}{3i} \cdot \frac{i}{i} = \frac{2i}{-3}$$

ex:

$$\frac{6}{\sqrt{-2}} = \frac{6}{i\sqrt{2}} \cdot \frac{i\sqrt{2}}{i\sqrt{2}}$$

$$\frac{6i\sqrt{2}}{-2} = -3i\sqrt{2}$$

Complex Numbers $a + bi$ where $a, b \in \mathbb{R}$ ex: $3 + 2i$

Pure imaginary number

 bi where $b \neq 0$ ex: $2i$

ex:

$$(3 + 6i) + (4 - 2i)$$

$$7 + 4i$$

ex:

$$(3 + 6i) - (4 - 2i)$$

ex:

$$(3 + 4i)(5 + 2i)$$

FOIL

ex:

$$\frac{(4-3i)}{(2-4i)} \cdot \frac{(2+4i)}{(2+4i)} = \frac{8+16i-6i-12i^2}{20}$$

$4-16i^2$

$$= \frac{20+10i}{20}$$
$$= \frac{2+i}{2}$$

Hw
p274
21-41 odd 44, 50, 56